Stoller
Grand Junction Office established 1959

299-E28-2 (A6785)
Log Data Report

Borehole Information:

Borehole: 299-E28-2 (A6785)			**Site:** Northeast of B Plant		
Coordinates (WA State Plane)		**GWL (ft)[1]:** 283.7		**GWL Date:** 6/19/2002	
North	**East**	**Drill Date**	**TOC[2] Elevation**	**Total Depth (ft)**	**Type**
136,863.9 m	573,704.5 m	Jan. 1948	208.6 m (684.4 ft)	322.5	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Steel Welded	1.7	8.625	8.0	0.3125	1.7	318

Borehole Notes:

The logging engineer measured the casing using a steel tape. Zero reference is the top of casing stickup. Top of casing stickup is evenly cut. A reference point survey "X" was not located on the casing stickup. HWIS[3] is the source of the TOC elevation and coordinates. Total depth (ground level reference) and casing bottom (ground level reference) are reported from information provided in Ledgerwood (1993). Stoller field personnel measured GWL (TOC reference).

Logging Equipment Information:

Logging System:	Gamma 2B		**Type:** SGLS (35%)
Calibration Date:	11/01/01	**Calibration Reference:**	GJO-2002-287-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5
Date	06/24/02	06/25/02	06/26/02	06/27/02	06/28/02
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	103.0	310.0	244.5	154.5	260.0
Finish Depth (ft)	2.0	243.5	153.5	102.0	230.0
Count Time (sec)	100	100	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N/A[4]	N/A	N/A	N/A	N/A
MSA Interval (ft)	0.5	0.5	0.5	0.5	0.5
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	BB123CAB	BB124CAB	BB125CAB	BB126CAB	BB127CAB
Start File	BB123000	BB124000	BB12500	BB126000	BB127000
Finish File	BB123202	BB124133	BB125182	BB126105	BB127060
Post-Verification	BB123CAA	BB124CAA	BB125CAA	BB126CAA	BB127CAA
Depth Return Error (in.)	0	0	-2.5	-1	0

Log Run	1	2	3	4	5
Comments	Fine-gain adjustment notes below.	Fine-gain adjustment note below.	Fine-gain adjustment notes below.	No fine-gain adjustment.	Repeat section. No fine-gain adjustment.

Logging Operation Notes:

Zero reference was the top of casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT verifier with serial number 082.

During the SGLS logging fine-gain adjustments to maintain the 1460-keV (^{40}K) photopeak at a pre-described channel were necessary. During log run 1, 06/24/02, fine-gain adjustments were made after files BB123164 and BB123166. On 06/25/02, during log run 2, a fine-gain adjustment was made after file BB124000. On 06/26/02, during log run 3, fine-gain adjustments were made after files BB125099 and BB125122.

Analysis Notes:

Analyst:	Sobczyk	Date:	07/02/02	Reference:	

SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. All of the verification spectra were within the control limits except for verification spectrum BB127CAA. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were generally lower and within 8 percent of one another.

On June 28, 2002, log run 5, the BB127CAA (post-verification) spectrum failed to meet one of the six acceptance criteria. The recorded peak counts per second at the 2615-keV photopeak on the post-run verification spectrum was less than 90% of the peak counts per second on the pre-run. Examinations of spectra indicate that the SGLS did not appear to have functioned normally during log run 5. The spectra from log run 5 appear to have reduced sensitivity in the high-energy range (above about 1500 keV), and ^{232}Th values for log 5 are too low. Log run 5 is the repeat section, and these data are outside of the acceptance criteria.

Log spectra for the SGLS were processed in batch mode using APTEC Supervisor to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC Supervisor. Concentrations were calculated in Excel (source file: G2BNov1.xls), using parameters determined from analysis of recent calibration data. Zero reference was the top of the casing. The casing configuration was assumed to be one string of 8-in. casing with a thickness of 0.3125 in. to the maximum depth of the log. This casing thickness was measured by the logging engineer. A water correction was applied to the SGLS data below 282.8 ft. Dead time corrections were not needed because dead time did not exceed 10.5 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 609 keV was used to determine the naturally

occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 1764 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs and ^{60}Co were the man-made radionuclides detected in this borehole. ^{137}Cs was detected at the ground surface (2.0-ft log depth) with an activity near its MDL of about 0.2 pCi/g. ^{60}Co was detected in the interval from 305.5 to 310.5 ft with activities ranging from the MDL (0.15 pCi/g) to 0.5 pCi/g.

Recognizable changes in the KUT logs occurred in this borehole. A gradual increase in apparent ^{40}K activity of about 5 pCi/g begins at approximately 12 ft, while there is a 25-cps increase in total gamma at 20 ft. In the interval from 158 through 168 ft, there is an increase in total gamma of up to 40 cps with a corresponding increase in apparent ^{232}Th activity of about 0.25 pCi/g. At about 209 ft, a decrease of about 5 pCi/g in apparent ^{40}K activity occurs. Apparent ^{40}K activity increases by about 4 pCi/g at 234 ft. In the interval from 247 through 254 ft, apparent ^{40}K and ^{238}U activities are elevated with a corresponding 50-cps increase in total gamma. The apparent ^{232}Th activities below 243.5 ft (log run 2) are anomalously low and should be considered suspect. During log run 2, the apparent ^{232}Th activities are about 0.3 pCi/g lower than expected and may indicate a malfunction in the logging system.

The plots of the repeat logs (log run 5 versus log run 2) demonstrate a loss in sensitivity in the high-energy range (above 1500 keV) of the SGLS data. The plots of the repeat logs at 609 keV and 1461 keV demonstrate good repeatability of the SGLS data at these energy levels. However, at 1764 keV and 2614 keV, the original log is about 0.25 pCi/g higher than the repeat log.

The 5/17/63 gross gamma profile from Additon et al. (1978) (attached) indicates gamma-emitting contamination in the borehole below 93 m (305 ft) at the time of the log. On 8/2/63, the reported groundwater level in this borehole was 124.09 m or a log depth of about 84.5 m (277 ft) versus a current groundwater depth of 86.5 m (283.7 ft). The SGLS log detected ^{60}Co in the interval from 305.5 to 310.0 ft with activities ranging from the MDL (0.15 pCi/g) to 0.5 pCi/g. The profile above about 93 m (305 ft) does not appear to detect gamma activity above background in the borehole.

References:

Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Well*s, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

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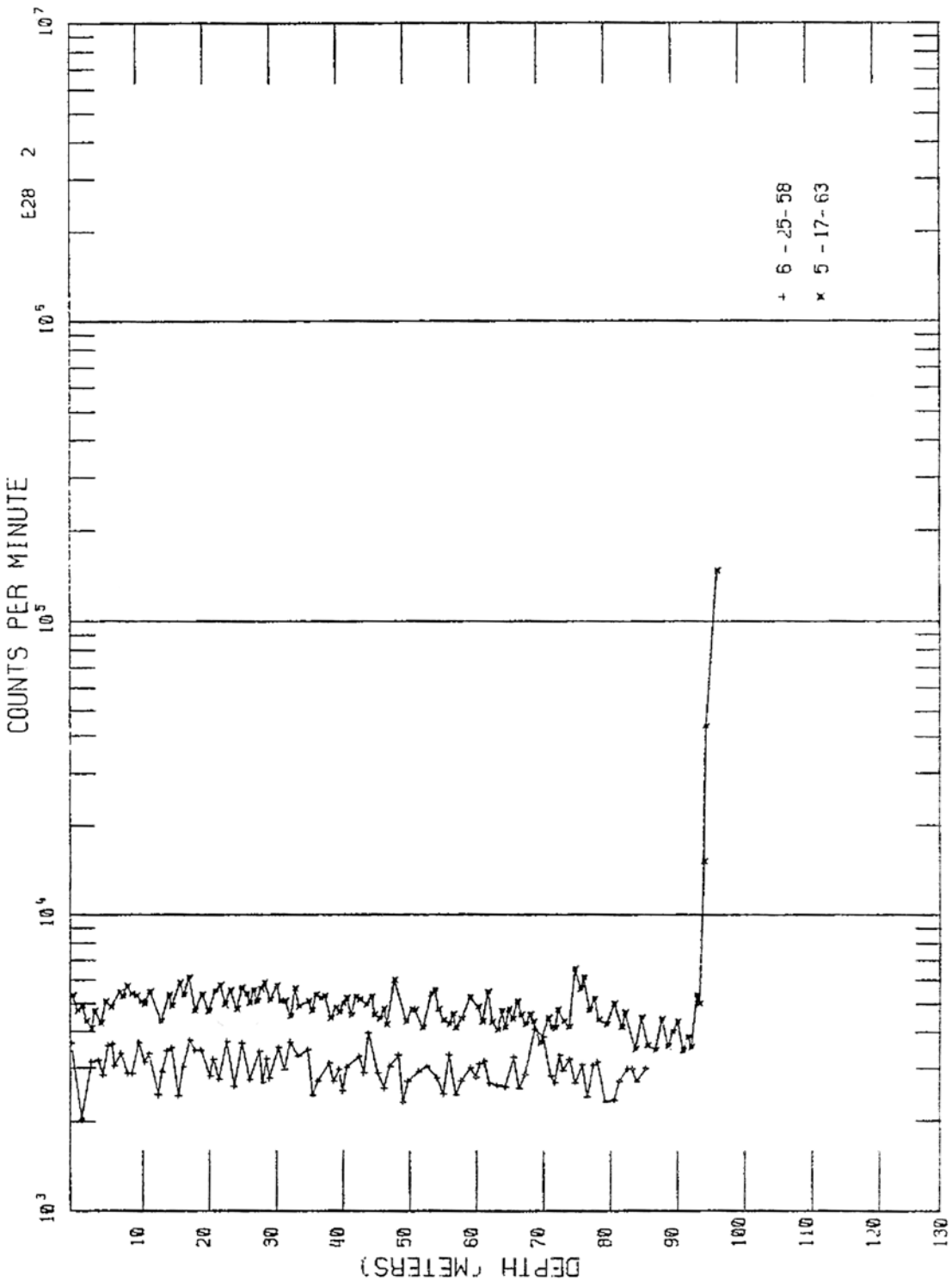
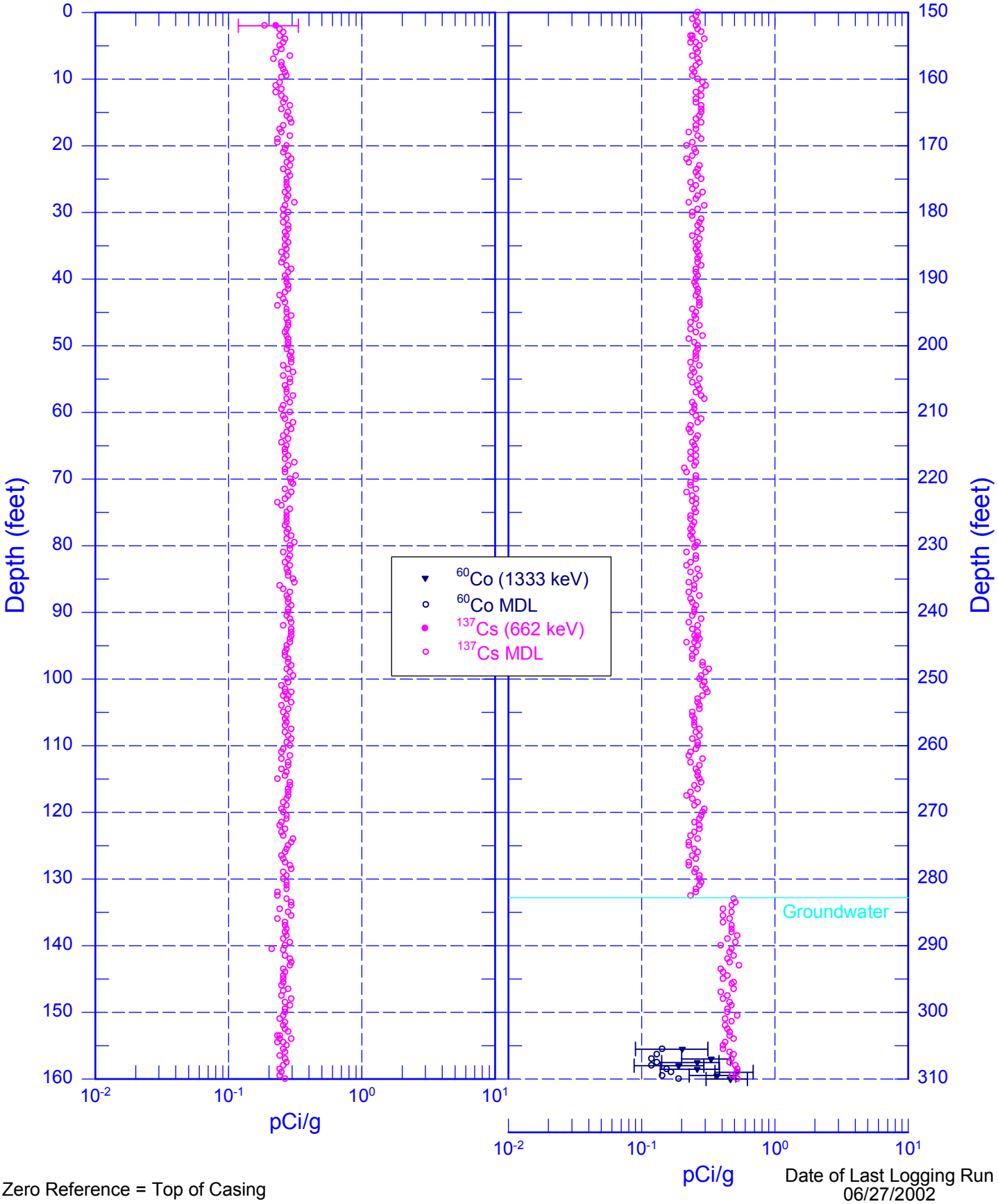
[1] GWL – groundwater depth
[2] TOC – top of casing
[3] HWIS – Hanford Well Information System
[4] N/A – not applicable



from Additon et al. (1978)

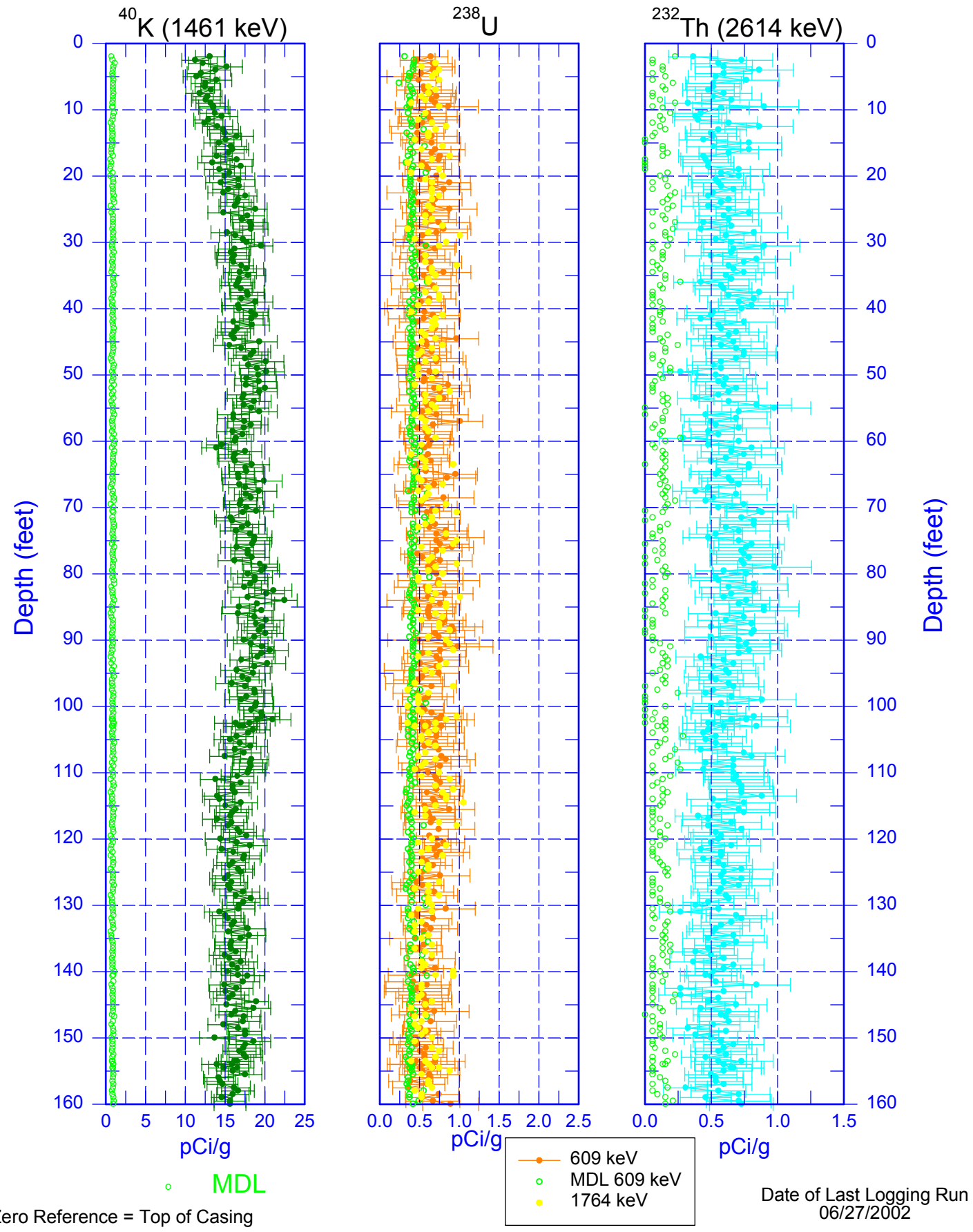
299-E28-2 (A6785)
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
06/27/2002

299-E28-2 (A6785)
Natural Gamma Logs



Zero Reference = Top of Casing

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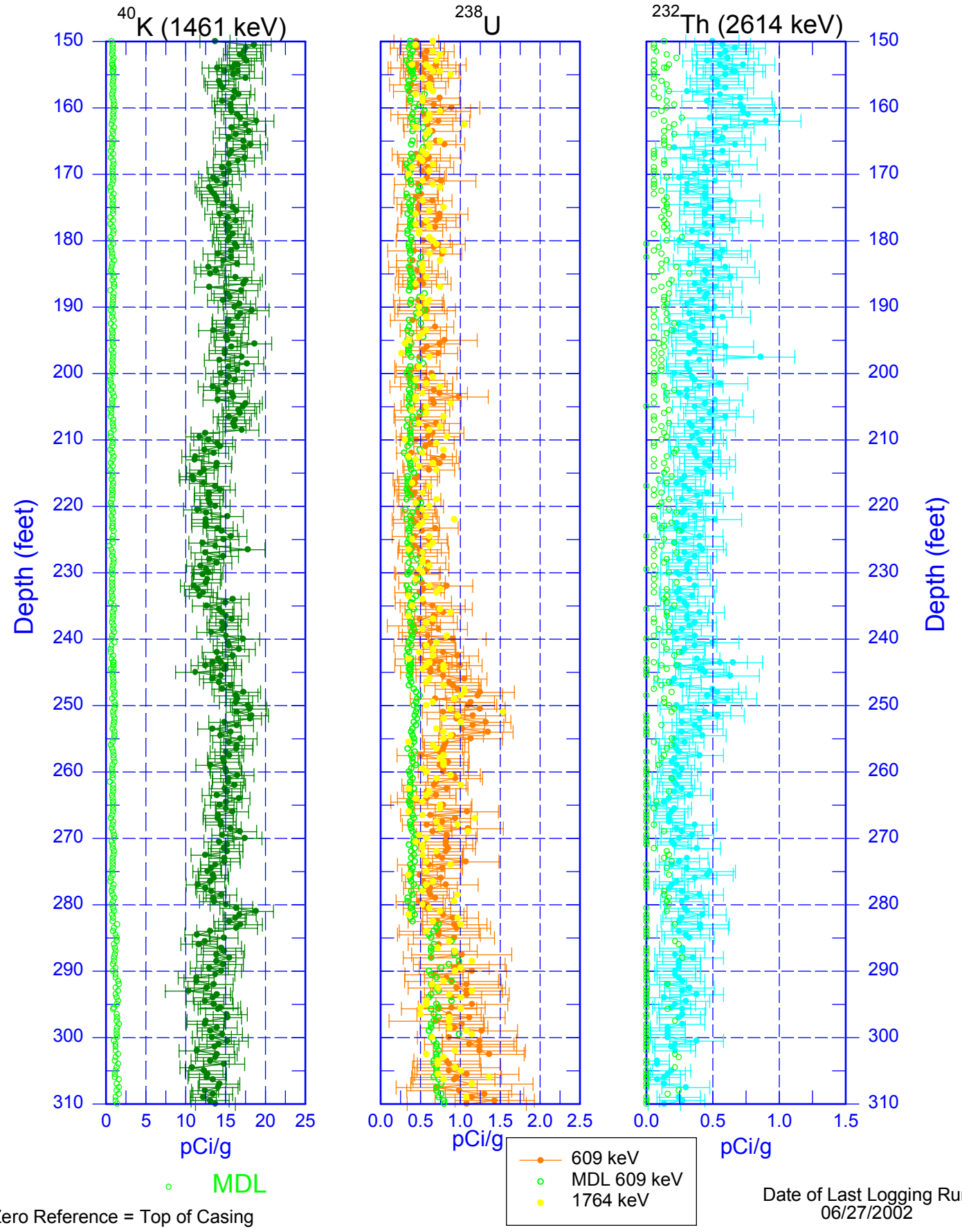
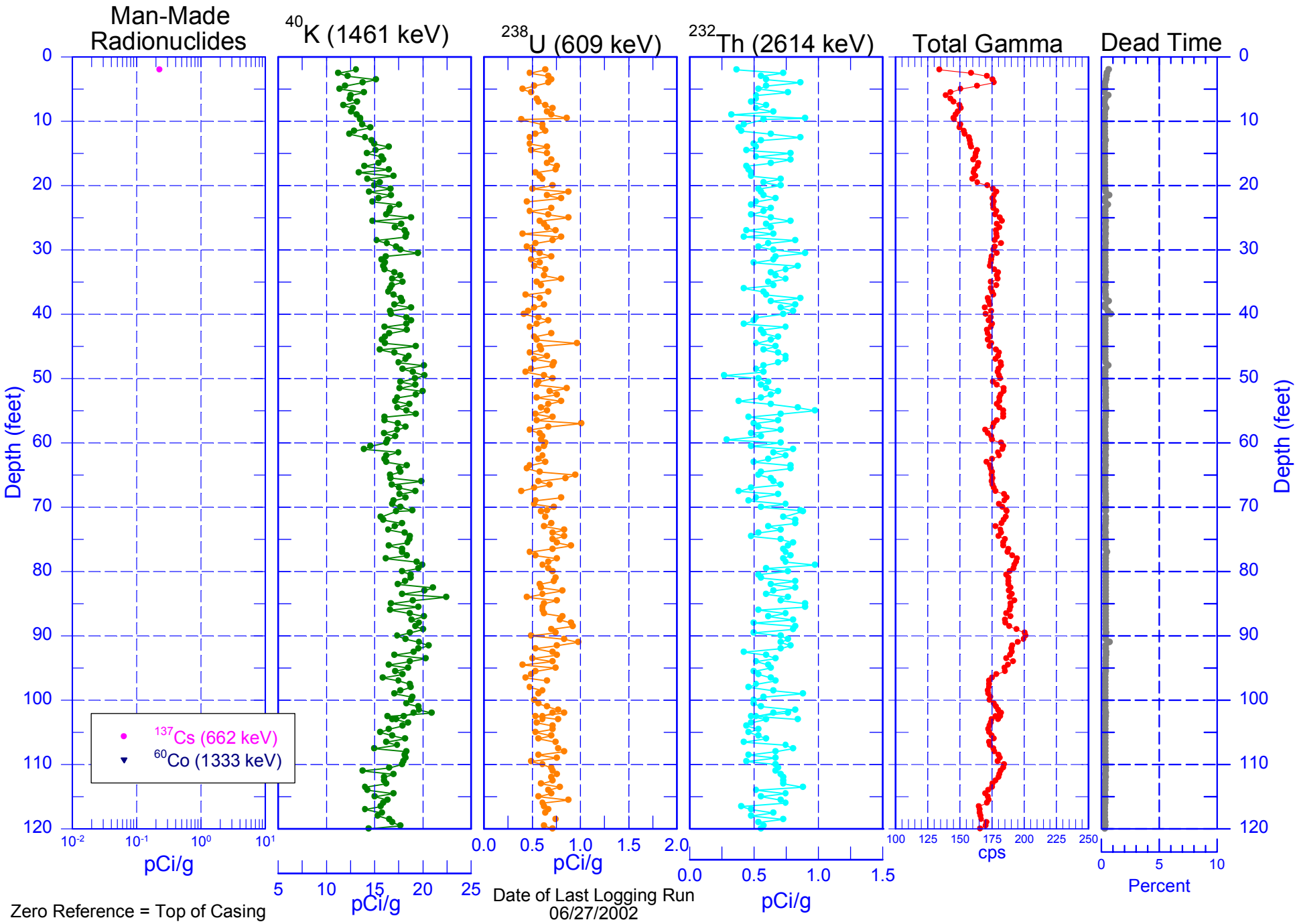
Natural Gamma Logs



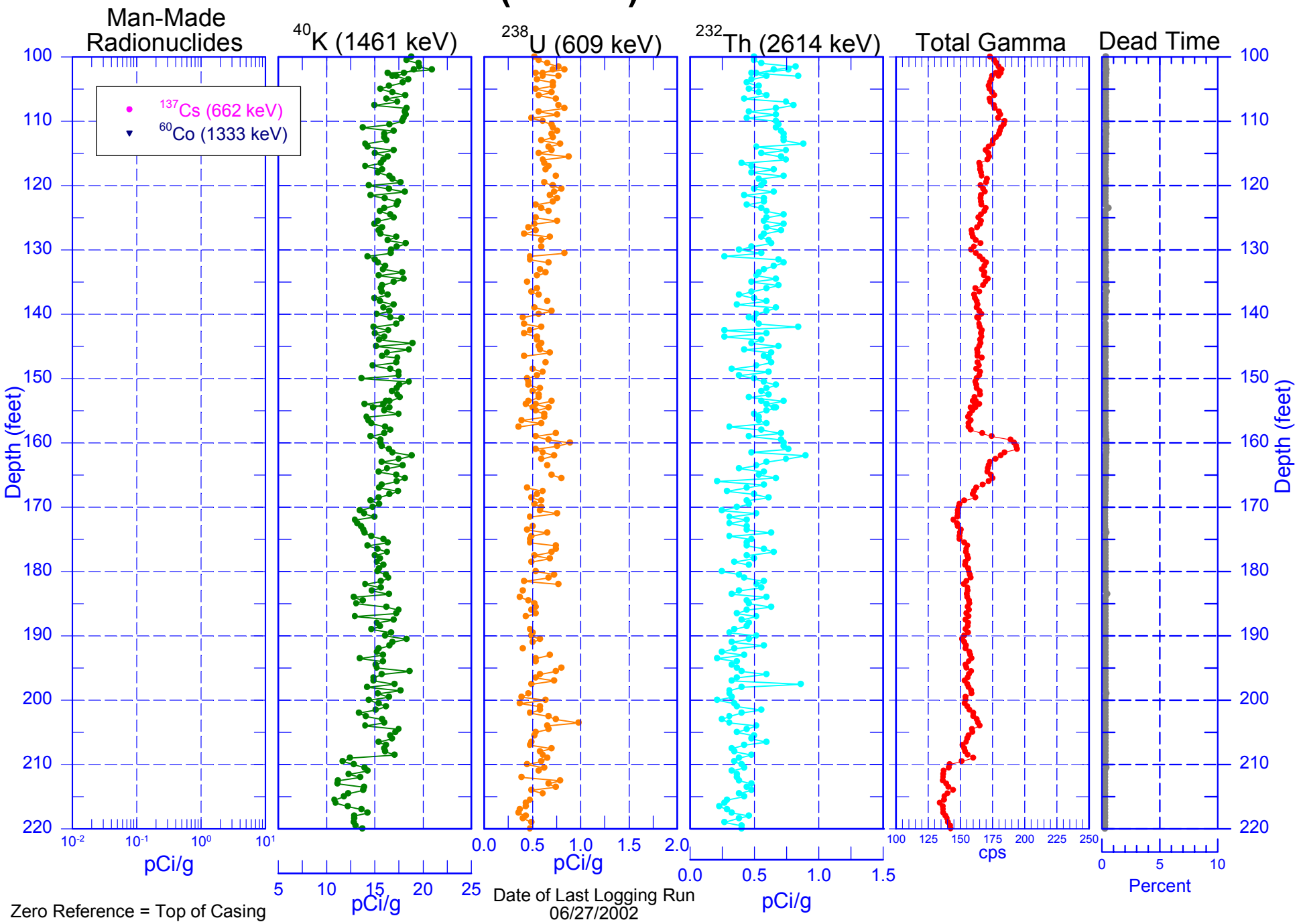
Zero Reference = Top of Casing

Date of Last Logging Run
06/27/2002

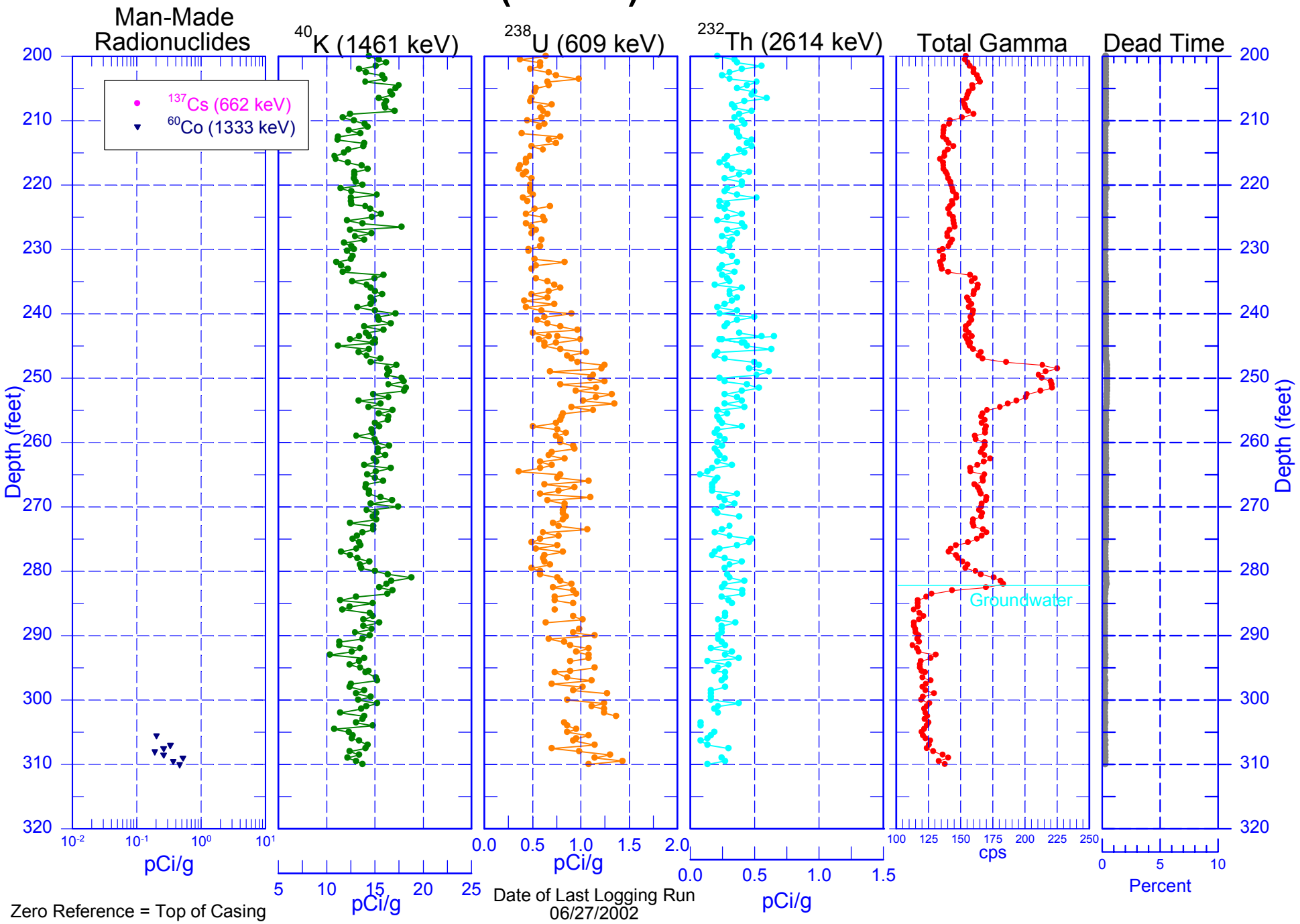
299-E28-2 (A6785) Combination Plot



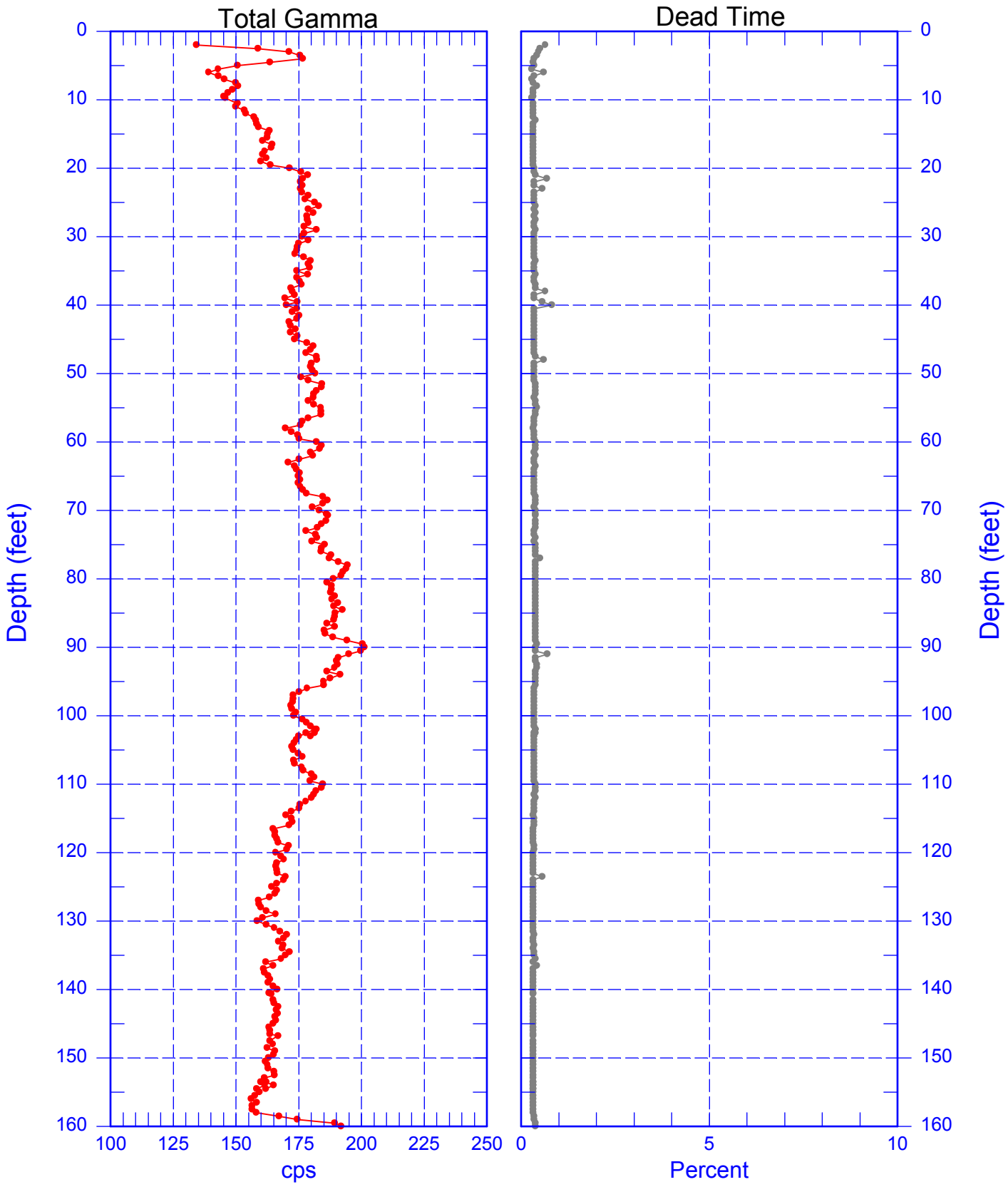
299-E28-2 (A6785) Combination Plot



299-E28-2 (A6785) Combination Plot



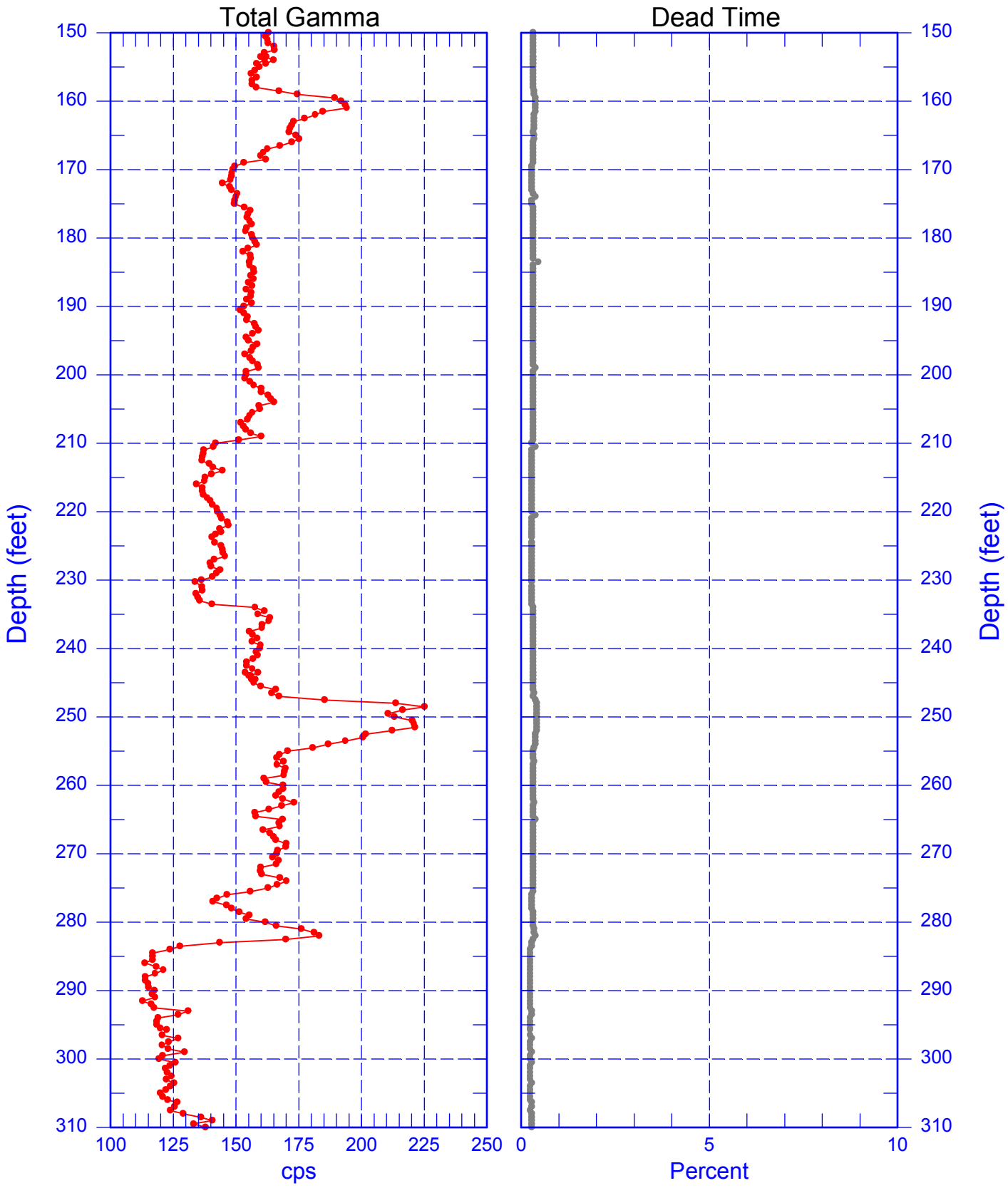
299-E28-2 (A6785)
Total Gamma & Dead Time



Zero Reference = Top of Casing

Date of Last Logging Run
06/27/2002

299-E28-2 (A6785)
Total Gamma & Dead Time



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299-E28-2 (A6785)

Rerun of Natural Gamma Logs (230.0 to 260.0 ft)